

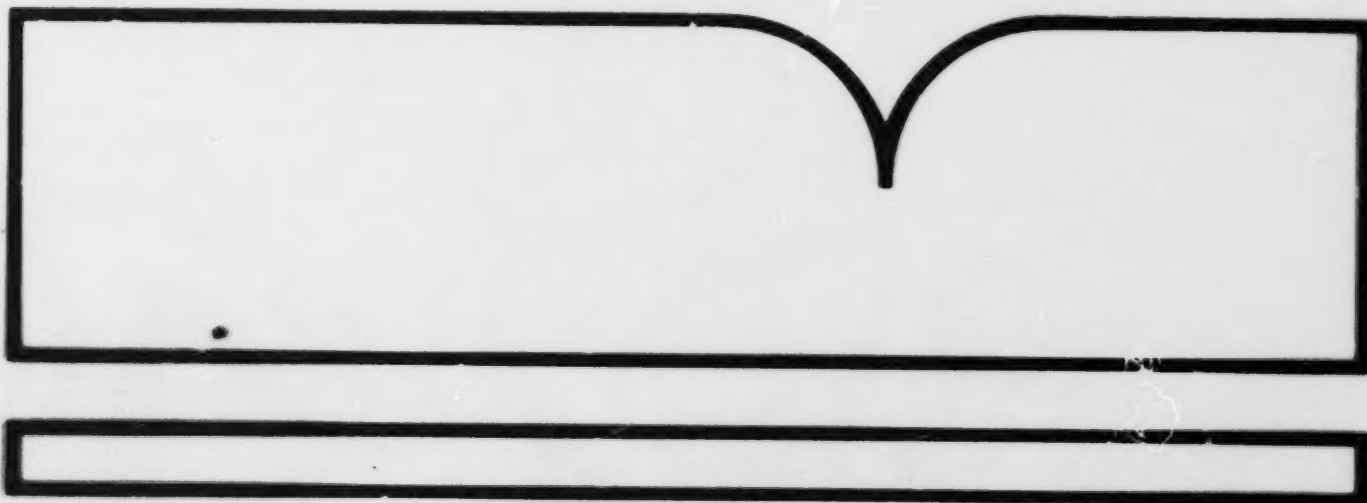
Waste Reduction Assistance Program (WRAP) On-Site
Consultation Audit Report: Aviation Facility

Alaska Health Project, Anchorage

Prepared for:

Environmental Protection Agency, Seattle, WA

28 Jul 87





Alaska Health Project

WASTE REDUCTION ASSISTANCE PROGRAM (WRAP)

ON-SITE CONSULTATION AUDIT REPORT:

AVIATION FACILITY

ALASKA HEALTH PROJECT
431 W. 7TH, SUITE 101
ANCHORAGE, AK 99501

JULY 28, 1987

REPORT DOCUMENTATION PAGE		1. REPORT NO. 002-014 A	2.	3. Recipient's Accession No. PB 90 160524/AS
4. Title and Subtitle Waste Reduction Assistance Program (WRAP) On-Site Consultation Audit Report: Aviation Facility				5. Report Date July 28, 1987
7. Author(s)				6.
9. Performing Organization Name and Address Alaska Health Project 431 W. Seventh Avenue, Suite 101 Anchorage, AK 99501				8. Performing Organization Rept. No.
12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency Region 10 1200 Sixth Avenue Seattle, Washington 98101				10. Project/Task/Work Unit No.
15. Supplementary Notes This document is included in the Pollution Prevention Information Clearinghouse, operated by Science Applications International Corporation (SAIC) for the U.S. EPA, at 8400 Westpark Drive, McLean, Virginia 22102.				11. Contract(C) or Grant(G) No. (C) (G)
16. Abstract (Limit: 200 words) This document reports on an environmental audit of a typical Alaskan aviation maintenance shop. It identifies the hazardous wastes produced and the processes that cause them, makes recommendations to reduce the amount of waste generated, identifies common waste management practices and recommends methods for storage and shipping, and provides a general analysis of the cost benefits of the recommended waste reduction methods. Appendices include a synopsis of small quantity generator regulations, a table of hazardous wastes from the aviation industry, and several articles about used oil disposal.				13. Type of Report & Period Covered environmental audit
14.				
17. Document Analysis a. Descriptors pollution prevention				
b. Identifiers/Open-Ended Terms				
c. COSATI Field/Group				
18. Availability Statement Release unlimited		19. Security Class (This Report)		21. No. of Pages 40
		20. Security Class (This Page)		22. Price

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READERS NOTE:

The information contained herein is intended to be general guidance for the facility described in this report and the industry as a whole. It is the product of approximately 6 to 8 hours of on-site consultation. The focus of the report is waste management and waste reduction, not regulatory compliance. Regulatory issues mentioned herein are discussed only insofar as they impinge on management issues related to hazardous waste management and waste reduction, and are not part of a comprehensive discussion about all pertinent regulation requirements. Waste determinations were made from available data, no on-site sampling took place. Managers interested in specific information on hazardous waste regulations should contact the nearest EPA or Department of Environmental Conservation office. Waste reduction measures are described briefly and should be further evaluated and balanced against unique conditions of each specific business.

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ON-SITE CONSULTATION AUDIT REPORT
AVIATION FACILITY

Alaska Health Project
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INTRODUCTION

A. The Waste Reduction Assistance Program (WRAP)

In 1986, the United States Environmental Protection Agency (U.S. EPA) awarded a RCRA 8001 grant to the Alaska Health Project, a private non-profit organization located in Anchorage, Alaska. The grant was provided to develop and deliver a pilot project to assist Alaska's Small Quantity Generators (SQGs) in complying with new SQG regulations. The project, the Waste Reduction Assistance Program (WRAP) has two principle goals:

1. To conduct outreach and education activities to support EPA's Small Business Initiative to achieve SQG compliance with new SQG hazardous waste regulations.
2. To conduct on-site audits to investigate hazardous waste management practices and processes for specific SQG categories.

WRAP on-site consultation audits are conducted with the understanding that the identity of selected SQGs remain confidential and that all audit reports contain no specific facility identifiers. Audit results and recommendations are intended to be as widely applicable to other SQGs in Alaska. Audit reports are available to interested parties upon request.

This report is the product of conducting an environmental audit of an Alaskan aviation maintenance facility. The report goals are to:

1. Analyze a typical aviation maintenance shop in Alaska and publish the findings in a report.
2. Provide a format, by making this report available, to other aviation maintenance facilities to conduct their own environmental audit.
3. Identify hazardous wastes produced in the aviation maintenance industry and the processes by which they are generated.
4. Make recommendations, if appropriate, to reduce the amount of hazardous waste generated.
5. Identify common waste management practices and advise on possible better methods to store, ship, and otherwise handle hazardous wastes.
6. Provide a general analysis of the cost benefits of waste reduction methods recommended in this report.

All recommendations, information, and cost data are subject to change. They will not reflect future market conditions, regulatory climate, and changes in shop processes. This report

offers only general guidance to other small quantity generators and all the information provided should be balanced against the unique conditions of each specific business.

B. Audit Methods

The audit team consisted of an environmental health scientists, and an environmental health specialist. Additional assistance was provided by a civil engineer, and a certified public accountant. The audit comprised two main steps.

1. Interview and data collection
2. Plant walkthrough

Step One consisted of an interview with the facility manager. The interview was designed to collect the following information.

1. General plant information (size, operations, employees, etc.)
2. Plant processes information/waste characterization
3. Material Safety Data Sheets
4. Current waste management/waste reduction practices

Step one was also designed to provide the shop manager with a detailed description of the audit process.

In Step Two, the on-site audit team and the shop manager conducted a visual inspection of the plant operations and processes. The audit team identified processes generating hazardous wastes and investigated current waste management practices.

The approximately 8 hours of on-site consultation included no environmental sampling or industrial hygiene monitoring. All information provided in this report is based upon the interview, walkthrough, and a review of current and available literature. Hazardous waste determinations were based upon a review of material safety data sheets, existing laboratory reports, any waste manifests, and EPA literature. Waste volume figures are based upon estimates made by the generator and the audit team during the plant walkthrough.

II. Aviation Maintenance Process Description

The facility described in this audit is a general aviation facility which operates and maintains fixed-wing aircraft and helicopters, or "ships" as they are referred to in the trade. It is located in an industrial area on state leased land. The surface area of the facility is approximately 21,000 square feet. The company employs 25 people in the winter and 45 people in the summer. The number of maintenance mechanics fluctuates between 12 and 14. The size of the facility is moderate to large by Alaska standards.

The shop mechanics perform minor to major equipment repairs and inspection. Major engine overhauls and instrumentation repairs are serviced by a separate facility outside of Alaska. The company services a fleet of twenty helicopters and 3 fixed-wing aircraft. Mechanics also maintain private aircraft from third parties. Approximately 15 per cent of the maintenance volume is for third party aircraft.

Processes and Materials

The majority of maintenance work performed involves parts inspection, cleaning, painting, and oil changes. The company is also starting up a nickel plating operation to maintain metal surfaces and prevent corrosion and other surface wear.

1. Parts Inspection

Mechanics inspect ship parts for cracks, pores, and surface flaws using one of two methods depending whether the metal is ferrous or non-ferrous.

Non-ferrous metals are inspected by using a "Zyglo" process. This process involves manually dipping a part into a series of baths containing penetrants, emulsifiers, rinses, and developers. Drag-out is minimized by allowing residual solution to drain back into its respective bath prior to placing the part into the next bath.

Cracks and pores are impregnated by the penetrant. The emulsifier bath is used to remove penetrant from areas of the metal part that do not contain any surface flaws. The part is then rinsed in a sink and put into a developer solution which highlights the remaining penetrant. The part is then placed in a dryer. Heat from the dryer expands the metal and forces the penetrant to the surface. After drying, the part is placed under a "black light" and it is inspected for glowing flaw markers.

Cracks and surface flaws in ferrous metals are scanned by using a Magnaflux process. Mechanics first magnetize the part using an electric coil. A "carrier solution" containing phosphorous and steel particles is then sprayed onto the part. The polarity created by cracks in ferrous metals enables the carrier solution to bind to the crack. Mechanics place the part under a black light to inspect for any part damage.

2. Parts Cleaning

Before mechanics can adequately perform inspection and maintenance, parts must be cleaned. This particular facility uses two cleaning processes, one to clean engines, and the other to clean various machine parts.

a. Engines

Engines, soiled with turbine smoke and other contaminants, are cleaned using a high pressure hot water cleaning system, called a Hotsy, and a detergent solution.

Manufactured by the Hotsy Corporation, the washer system uses either water alone, or with a detergent. According to the facility manager, detergent based cleaning solutions are "faster and better" than using the organic solvents they once used. In addition, the Hotsy is portable allowing mechanics to clean ship engines outside of the hanger.

Principal ingredients in the detergent include ethylene glycol monobutyl ether, sodium metasilicate, and sodium dodecylbenzene sulfonate. The detergent comes in a concentrate solution and during use the manufacturer recommends a dilution ratio of 1 part concentrate to 100 parts water.

It should be noted that the National Institute for Occupational Safety and Health (NIOSH) has conducted several studies on ethylene glycol ethers (one component of the detergent used in the Hotsy). They have demonstrated reproductive risks associated with exposures to specific ethers within the family of glycol ethers. The glycol ether used in the Hotsy detergent has received limited experimental analysis in this regard. However, NIOSH warns that structurally related glycol ethers may have similar reproductive effects. Proper worker protection should be stressed when using the Hotsy detergent regardless of the dilution factor.

b. Other parts

Other parts are cleaned using a traditional parts washer and stoddard solvent.

The cleaning process begins by pre-washing parts in the parts washer. Prior to removal, excess solvent is allowed to drain back

into the washer. The part is then removed from the washer and any residual particulate matter is removed using pressurized solvent spray.

This process occurs in a 3 ft. x 3 ft. booth enclosed on three sides which is adjacent to the parts washer. The part is placed on a metal grate inside the booth. The part is sprayed and waste solvent is collected in a drum below the grate and filtered back into a clean solvent drum.

3. Paint Stripping

Paint stripping is performed to prepare equipment and components for reconditioning and recoating. Paint stripping operations can include sprays, brushes or baths containing solvents that loosen and dissolve old coatings.

This shop strips parts using a solvent bath containing methylene chloride, phenols, cresol, xlenols. Loosened paint is brushed off and becomes part of the tank bottom sludge. Residual solvent is rinsed off with a waterwash.

Shop mechanics also strip paint off of ship parts (that are too large for the solvent bath (tank) described above) by brushing a solvent containing methylene chloride, phenol, and formic acid onto the part. Paint and other surface material are then scraped off, collected, and managed as hazardous wastes.

4. Painting

Once stripped the part is then prepared for painting. A primer is sprayed, using an air gun, on the part. Once the primer has dried, the part receives a final coat of paint. Principal materials used during the painting process include lacquer thinner, methyl ethyl ketone and paint. When using isocyanate-based paints workers utilize supplied-air respiratory protection. The shop has a paint spray booth.

5. Metal Plating

Plating is a process whereby a thin layer of metal is deposited onto a base metal to improve its appearance, resistance to wear, or to improve other properties of the base metal.

This shop uses a Selectron process -an electrochemical metalizing process (similar to welding) which takes metal in solution and "plates" it to the part. Prior to plating, the metal is first cleaned with Selectron Electrocleaning Solvent. The principal ingredient in this solvent is sodium hydroxide.

The plating process is done in a small tray so that any spilled and/or excess plating solution is captured and returned to the appropriate storage container. Plating solutions primarily used

by the shop include copper, nickel, and cadmium. Perhaps the greatest concern in this process is worker exposure to metal fumes during the plating process. Cadmium is a recognized carcinogen. Exposure to nickel and copper can result in metal fume fever, and other lung and upper respiratory irritations. Occupational exposures are not the focus of this audit, however it is important that workers are protected during the plating process and that local exhaust ventilation is used to draw metal fumes away from the breathing zone of the worker.

6. Oil Changes

Turbine engine oils are changed approximately every 300 hours. The oil is drained into a collection reservoir and then transferred to the 300 gallon underground storage tank.

III. Waste Generation

A. Waste Generation by Process

The wastes produced by the aviation facility are described in this section. Table III.1 shows that type and the quantity of waste generated by the various facility operations described in Section II. The type and the quantity of wastes generated were determined from the audit interview, available Material Safety Data Sheets, and from the literature. No on-site waste sampling waste performed.

Table III.1
Types of Potential Hazardous Waste Generated

Process	Waste Type	Quantity
Inspecting Parts- Zyglo	wastewater	unknown
Inspecting Parts- Magnaflux	none, recirculating process	_____
Engine Cleaning	wastewater, detergent	unknown waste- water. 110 gals. detergent/year
Parts Cleaning	stoddard solvent, heavy metals, sludge	approx. 55 gal./ year
Paint Stripping	solvent sludge, heavy metals, paint waste	precise amount unknown. Mixed with paint wastes
Painting	waste paint, solvent	110 gals./yr. includes paint stripping wastes
Electrochemical Plating	none, metal solutions recycled	-----
Changing Oil	used oil, lead, heavy metal, and halogen content unknown	120 gals./ year

Parts Inspection

Wastes generated during the parts inspection process are minimal. The materials and solutions used in the magnaflux process are recirculated back into the system by design. Waste generated during the Zyglo process occur during the rinse cycle. Volumes and constituent contents of the wastewater is not known. The company water supply is supplied by a private well. Evaporation of Zyglo chemistry is minimized by keeping lids on the baths when not in use. Dragout is minimized by allowing parts to drain completely between baths.

Parts Cleaning

Hotsy

Waste generated during engine cleaning is waste washwater resulting from the Hotsy pressure washer. This is generally performed outside of the hanger and the wastewater evaporates. The waste is considered non-toxic and biodegradable according to the manufacturer

Parts Washer

Approximately 55 gallons/year of solvent waste (stoddard) is generated from the parts washer. Waste solvent is mixed with used oil and stored in the 300 gallon underground storage tank.

Approximately 10 percent of the total waste volume is produced from pressurized cleaning after the parts come out of the parts washer. Solvent losses are also experienced due to overspray and evaporation during pressurized cleaning.

According to the interview the shop uses approximately 85 to 110 gallons of solvent per year for parts cleaning. Conceivably, one third to one-half of the raw material is lost through evaporation, overspray, and miscellaneous spills.

Paint Stripping

Wastes generated during paint stripping operations include spent solvent, contaminated sludge, and paint waste. Paint chips and other debris produced during brush stripping operations are collected on a plastic ground cloth and deposited into a 55-gallon waste storage drum.

Little waste is generated from the stripping bath tank primarily because the tank solution is "rarely changed". Bottom tank sludge is collected and removed periodically. Mechanics estimate that they generated a full "coffee can" of sludge per year. Sludge material is collected with a scoop and deposited into the 55-gallon storage container.

Painting

Wastes generated during painting operations include waste paint, waste thinner, waste paint-thinner mixture (slop thinner) generated from cleaning guns, contaminated rags and paper, soiled air filters, paint cans. Rags, paper, and empty paint cans are not generally considered hazardous wastes and are disposed of in refuse containers. Soiled air filters are also deposited into refuse dumpsters. The generator should consult with the local Solid Waste Services Department for prior approval for this type of disposal activity (561-1906). In the near future SWS may require that these waste materials be disposed at the local collection center.

Waste paint and slop thinner produced during painting operations are stored in a 55-gallon waste container (along with wastes from stripping operations). Approximately 110 gallons of paint/slop thinner is generated each year. Gun cleaning generates the greatest volume of slop thinner. After each painting job guns must be cleaned. Gun nozzles and paint "cups" are cleaned with thinner sprayed through the gun. Excess waste thinner generated is collected and transferred to the 55-gallon storage container.

Electrochemical Plating

According to the interview, it appears that the electrochemical plating operation generates little wastes for disposal. The process is performed over a tray and mechanics are careful to collect excess metal solution and return it to the quart sized storage containers. Plating solutions are consumed during the plating operation.

Oil Changing

Aircraft engine oil is changed and collected periodically. Approximately 120 gallons of used oil is generated per year. The oil is collected and stored in the 300 gallon underground storage tank (along with wastes from parts washing). As previously discussed, another 55 gallons of waste parts washing solvent is also stored in the 300 gallon tank. The entire 175 gallons is then burned for energy recovery in a non-industrial space heater.

B. Regulated Wastes

Waste paint/thinner mixture, waste oil, and solvent sludges are the principal hazardous waste generated at this aviation facility. Table III.2 gives various general classifications for these wastes. It should be noted that specific analysis of these wastes types has not been conducted and therefore the table should be viewed as only general guidance. Moreover, waste types, quantities, and classifications may well vary if new products are used, or workplace practices are altered.

Table III.2
Classification of Aviation Maintenance Wastes

Waste Type	Classification	Hazardous Waste Number
Paint waste/thinner mixture (containing Methyl Ethyl Ketone (MEK))*	Listed Hazardous waste	F005
Paint stripping sludge	Listed Hazardous Waste	F002
Parts washing solvent waste/sludge**	Ignitable waste	D001
Used Oil destined for energy recovery ***	Waste derived fuel	RCRA regulated 40 CFR, part 266 (e)

* The waste paint/thinner may be classified as ignitable, depending upon the exact constituent content of the mixture. A waste mixture is considered ignitable if it exhibits a flash point of below 140 degrees F. (40 CFR Part 261.21)

** Stoddard solvent used during parts washing has a flash point of 100 to 110 degrees F. and therefore exhibits the characteristic of ignitability. The heavy metal content of the sludge waste may exhibit the characteristic of EP Toxicity (40 CFR Part 261.24) and remain regulated waste. A waste analysis is necessary to make an actual determination.

*** See Appendix D for a more complete information on used oil provisions.

IV. Waste Management

A. Waste Storage

Businesses generating more than 100 kgs of hazardous waste in any calendar month must obtain an EPA identification number. A small quantity generator may not store hazardous wastes in quantities greater than 6000 kgs. for longer than 180 days. Waste may be stored for 270 days if it has to be transported over 200 miles to a licensed hazardous waste facility. This case applies to Alaska, which has no licensed hazardous waste disposal facility. Generators of less than 100 kgs per month of hazardous wastes are subject to the Small Quantity Generator requirements if they store more than 1,000 kgs of hazardous waste.

Hazardous waste containers should be clearly labeled "hazardous wastes." The containers should also be marked with the date the collection of the wastes began. The containers should be kept in good condition, closed, and inspected once per week. The wastes, if ignitable or reactive should be stored as far as possible from the facility property line. The wastes may be treated on-site without a permit provided:

- a. They are treated within 180 days (in Alaska, 270 days).
- b. The containers conform to the regulation described in the above paragraph (see actual regulations for specific requirements).
- c. Steps are taken to prepare for and prevent accidents as described in the regulations.

Precautions should be taken to prevent accidents involving the hazardous materials stored on site. The regulations for the storage of hazardous materials and wastes were written to prevent accidents, spills, fires, and explosions, and releases into the environment. The operator of the facility should develop a emergency response plan and coordinate with the local fire department or other emergency response agency. The operator should also train workers in the proper handling and storage of hazardous wastes and be certain that they are familiar with emergency procedures. It is further recommended that the facility manager develop a contingency plan to address accidents involving hazardous wastes stored and otherwise handled on-site.

B. Waste Disposal Methods

Waste classified as hazardous wastes must be disposed of in accordance with EPA and DOT regulations. There are no facilities in Alaska to dispose of hazardous wastes, therefore all wastes must be shipped out of state to a disposal site licensed to handle hazardous wastes. The wastes must be shipped in containers and labeled according to DOT regulations (49 CFR Part 172). A licensed hazardous waste transporter must transport

the waste. A uniform hazardous waste manifest must accompany the waste.

Used waste oil recovered for energy purposes is allowed by state and federal regulatory agencies under certain circumstances such as the type and level of contaminants present in the oil and the type of combustion chamber used. It should be noted that used oil mixed with a hazardous waste are fully regulated as hazardous wastes. Exceptions to this provision are provided for Small Quantity Generators in 40 CFR 266, Subpart E. provided that the oil is recovered for energy purposes (see appendix R).

C. Costs

Hazardous waste disposal costs can vary with the following factors:

1. Quantity and nature of the wastes.
2. Transportation distance.
3. Variations in the prices charged by the haulers and disposal facilities for the transportation and disposal of hazardous waste.

It may be advantageous to contact other generators of hazardous wastes to coordinate shipments to coordinate shipments and realize savings through bulk shipments. Waste determination fees may be reduced or eliminated if future waste streams remain constant. Shipping costs for Alaska's hazardous wastes increases total disposal costs for state waste producers.

Comprehensive disposal costs for a 55-gallon drum of hazardous waste produced in Alaska can cost up to \$1,390.00 (Glean Incorporated). See Table IV.1 for a cost breakdown. This is very generalized estimate which assumes incineration as the disposal method. Depending on the waste type, and alternative disposal methods, and bulk shipments, actual disposal costs may be greatly reduced.

However, the high disposal cost of hazardous waste should be taken into consideration when purchasing raw materials and planning expenditures. Production processes and methods should also be analyzed to identify means for reducing the generation of hazardous wastes and thereby disposal costs.

Table IV.
Hazardous waste Disposal Cost Estimate for One
55-Gallon Drum Generated in Alaska

Waste Determination (In-state lab analysis)	\$ 175.00
Transportation	\$ 310.00
Disposal Site Profile	\$ 200.00
Waste Acceptance Fee	\$ 125.00
Incineration	\$ 580.00
Total Cost	\$1,390.00

V. Waste Reduction Alternatives

A. Incentives

A number of incentives exist to promote hazardous waste reduction in the private sector. Waste reduction incentives include:

1. **High Disposal Costs:** Land disposal restrictions outlined in the Hazardous and Solid Waste Amendments of 1984 limit the number of untreated wastes that can be disposed on land, and impose stricter standards on surface impoundments and underground tanks. In addition, there is a lack of waste disposal facility capacity in the United States. Alaska generators must pay for high waste transportation costs. These and other factors contribute to the high costs of hazardous waste disposal.
2. **Financial Liability:** Generators of hazardous wastes incur liability for their wastes from the time that they are created until the time of their disposal. This is known as the "cradle to grave" concept. The liability includes potential improper handling by the waste transporter and the disposal facility. Generators are also liable for any future sudden releases of disposed wastes. The generator may be required to pay for the entire cleanup of a spill and/or waste site. Reducing hazardous waste generation translates into decreased financial liability.
3. **Public Relations:** Employing waste reduction techniques in a business can improve public perception of the business. A favorable perception can result in better community relations and possible financial gains.
4. **Safer Workplace:** Reducing waste generation can result in reduced worker exposure to hazardous materials and wastes.

B. Waste Reduction Categories

Waste reduction techniques can be grouped into the following broad categories:

1. **Process Technologies:** This involves the use of technology to reduce process wastes.
 2. **Plant Operations:** This category involves alterations in plant operations to reduce hazardous waste generation. Better inventory control and efficient use of raw materials are examples of plant operation changes that can be made to reduce hazardous waste production.
 3. **Plant Input Changes:** Another way to reduce hazardous wastes is to utilize raw materials that will not become hazardous wastes during the production process.
- .

4. In-process Recycling: This procedure recycles potential hazardous wastes by channeling waste back into the production process.

C. Potential Waste Reduction In the Aviation Maintenance Industry

Aviation facilities generate waste oils, spent solvents, paint/thinner mixtures, paint stripping wastes, and wastewater. The waste reduction techniques described in the previous section can be applied to the aviation maintenance industry.

In general, careful waste segregation, upper level management support, and a trained work force are vital to successful waste reduction in the aviation maintenance industry and most other industries. Several possibilities exist for waste reduction in the shop described in this report and for the aviation industry as a whole. Following are examples of potential waste reduction methods presented by process.

Paint Stripping

1. Process Technologies

Alternative technologies exist to eliminate the use of chemical solvent during paint stripping. These technologies will also reduce the large quantities of wastewater produced during stripping process. Typically, the wastewater is laden with heavy metals.

Sand and/or glass bead blasting can be used to strip paint from metal surfaces. These technologies are best suited for durable metal surfaces as sand (or glass) can damage delicate surfaces. Thus, this application may not be appropriate for the aviation industry.

Another, possibly better, alternative is plastic media blasting, or PMB. This process was developed by engineers at Hill Air Force Base and the process has accolades for waste reduction from the U.S. Department of Defense.

Briefly, small angular plastic "beads" are air blasted onto the painted surface. The plastic particles are harder than the paint but softer than the base metal. The plastic beads do not shatter on contact and can be reclaimed. According to the literature, as much as 95 percent of the beads can be separated out of the paint chip waste. The waste by-products may be considered hazardous depending upon the type of paint strip and the base metal. However, waste solvent, sludges, and wastewater from traditional stripping operations is eliminated. The PBM process requires construction of a paint stripping booth. Cost figures for the process were not available at the time of this audit write-up.

This process technology has been successfully used by the Navel Air Rework Facility (NARF) in Alameda, Texas, and the Corpus Christi Army Depot. The PBM process has been used to strip both helicopters and fix-winged aircraft parts, as well as entire aircraft (Hazardous Waste & Hazardous Materials, Vol. 4, No. 1 1987).

2. Plant Operations

Good housekeeping can greatly improve conservation of raw materials and help to reduce hazardous waste generation. Keeping lids on the paint stripping bath prevents loss of materials due to evaporation and helps eliminate workplace exposures. When cleaning out tank bottoms always allow residual solvent to drain back into the tank to prevent raw material loss due to dragout. Periodic agitation of the tank bath can keep solvent in solution and prevent sludge build-up. Regular cleaning of tank sludges will help reduce the absorption of raw materials into the tank sludge.

Finally, employees should be afforded the opportunity for periodic training in hazardous waste handling and control when appropriate. Trained employees are central to successful waste reduction.

Parts Cleaning

Solvent wastes contribute significantly to the waste volume of aviation maintenance facilities. Halogenated solvent wastes are expensive to dispose of, and the costs will most likely increase due to "land ban" amendments to the Resource Conservation and Recovery Act.

1. Process Technologies

The use of high pressure water washers has been successfully used in maintenance industries and reduced reliance on solvent-based parts cleaners. Generally, pressure washers use a detergent to enhance the cleaning process. The systems are closed-looped, thus it reuses filtered cleaning water. They do not generally generate hazardous wastes and wastewater can be disposed via the sewer system provided they satisfy the requirements set forth in the local sewer ordinance. Pressure washers do generate waste sludges which must be disposed in accordance to its contamination level. A lab analysis is necessary.

2. Plant Operations Changes

Good housekeeping can greatly improve the efficiency of solvent use. Keeping lids and bungs on containers prevents loss of chemicals through evaporation. Allowing parts to thoroughly

drain before removal from the parts washer prevents dragout and helps save raw material. Use of pumps and funnels to transfer materials will help prevent accidental spills. Regular cleaning of solvent sludges will reduce solvent absorption into the sludge and prevent sludge from going into solution. This will increase cleaning efficiency.

The aviation facility in this shop should further investigate raw material losses from use of pressurized solvent spray. Overspray and evaporation may significantly contribute to raw material loss. Simple engineering design changes, such as enclosing the spray booth, will eliminate this potential problem. Moreover, enclosing the system will reduce worker exposure to the solvent.

3. In-Process Recycling

Potential exists for recovery of waste solvents through solvent distillation. Distillation recovers used solvent through a process of heating the waste solvent and passing solvent vapor through a condenser to trap clean solvent. Still bottom sludges must be periodically disposed as hazardous wastes. Solvent distillation results in reduced waste volume and savings in raw material costs. Solvent distillation requires that wastes are segregated prior to being loaded into the still pot.

Painting

1. Process Technologies

Various process modifications can possibly reduce paint wastes. Facilities that mix their own paint allows painters to mix only what they need for a particular job, thereby avoiding waste paint.

Paint overspray translates into economic loss and results in the creation of more wastes. The literature indicates that as little as 30 percent of the paint reaches the target during paint spraying. The efficiency of spraying and the reduction in overspray can be enhanced by using electrostatic spray equipment, or gravity feed guns. Paint cups associated with spray guns are usually quart containers. Use of smaller cups would reduce waste generation by limiting over-mixing and by decreasing the amount of solvent needed for equipment cleaning.

Another method for reducing hazardous waste production is through the use of water-based paints instead of solvent-based paints. Water-based paints are less hazardous and no major equipment changes are required to convert to this process. Use of water-based paint systems have been successful in some equipment applications, and may be applicable in some instances in the aviation industry.

2. Plant Operations/Input Changes

Good housekeeping can greatly improve the efficiency of solvent and thinner use. Keeping lids on bungs and containers prevents the loss of chemicals through evaporation. Spills can be reduced by using pumps and funnels to transfer materials.

Proper paint mixing and spray painting techniques can be enhanced with periodic training opportunities for shop employees.

Cleaning of spray guns is a major source of waste generation in the painting process. Often more solvent is used than required. Use of only small amounts of solvent during cleaning operations can reduce the amount of waste generated. Reuse of waste thinner during initial cleaning operations can reduce the amount of fresh solvent used resulting in raw material savings and reduced waste generation.

3. In-Process Recycling

Waste paint/thinner can be reclaimed through distillation. See discussion on distillation in Parts Cleaning section described above.

Waste Oil

1. Recovery

Used oil can be reused as an energy source and in different types of recovery facilities depending upon constituent content. See Appendix D for a more detailed discussion.

The facility in this audit has purchased a waste oil furnace for the purposes of heat/energy recovery.

D. Feasibility Study

The generator discussed in this audit is generating 2 drums (110 gallons) of waste solvent/thinner per year. The shop also recycles approximately 175 gallons of used oil mixture per year. Since 1983, the shop has been disposing of their wastes at the state/municipal hazardous waste spring cleanup. Waste disposal records prior to 1983 are incomplete. According to the interview, in the past used oil was offered to a local waste oil dealer for disposal, reprocessing, or used as a dust suppressant.

Precise determination of the feasibility of various described waste reduction measures is limited due to the lack of historical data on facility disposal costs. Actual disposal costs will greatly affect the results of this feasibility study. Little incentive has existed in the past for waste reduction due to the availability of the free Spring Cleanup program. However,

incentives will increase as the program is slowly phased out and replaced by a operating collection and storage facility in Anchorage where the generator will have to pay for disposal.

Cost data on waste reduction technologies and process materials was also not always available to the audit team limiting the extent of the feasibility study.

The plastic media blasting system shows great promise and further research on the costs and applicability of this system is recommended. It is even more appealing due to its ability to reduce wastewater volumes associated with most solvent based paint stripping operations.

The used oil furnace was purchased by the facility for approximately \$2000.00. The price for disposal of used on-spec oil is generally \$.50 per gallon. The cost for disposing of 175 gallons of used on-spec oil is approximately \$88.00. An additional \$175.00 is required for a lab analysis. Assuming these costs alone, the payback period for the furnace is 7.6 years. The payback period will be further reduced when heating costs are considered. These figures were not available at the time of the audit.

A solvent distillation unit can be purchased by the facility for approximately \$5,000.00. These units are able to convert 5 gallons of waste solvent/thinner into 4.5 gallons of recycled material. This is a 90% recovery efficiency. The amount of waste produced is approximately .5 gallons of sludge waste per 5 gallons of waste solvent. Distillation is most effective when wastes streams are segregated. Simple stills cannot segregate components of similar boiling points.

Broad calculations estimate that the shop spends about \$5.00 per gallon on solvent/thinner product. Assuming the generation of sludge in the distillation process, the shop could recycle about 100 gallons of raw material. At the rate of \$5.00/gallon this equals a purchase cost of \$500.00 dollars. Disposal costs for 110 gallons of the waste, using the \$25.00/gallon rate mentioned earlier, would be \$2750.00. The total savings of the material costs and that of the disposal costs add up to \$3250.00. When compared to the initial cost of the distillation unit, the payback period is approximately 1.5 years.

It should be stressed that this payback period is based upon rough calculations and data. Other issues such as operation and maintenance costs, operator training, for example must also be factored into determinations about payback periods.

Other waste reduction measures previously described can be implemented at relatively little cost to the facility. Good housekeeping, more efficient paint spray guns, reductions in dragout and overspray are simple low cost measures that can greatly contribute to waste reduction efforts in the shop. Enclosing the pressurized solvent spray booth may greatly decrease raw material losses.

VI. Summary and Conclusions

The aviation maintenance facility described in this audit generates approximately 110 gallons of hazardous waste per year. This translates into approximately 968 pounds per year or 81 pounds per month. Precise monthly waste generation production was not available. The shop produces approximately 175 gallons of used oil fuel that is burned for energy recovery. Generators of fewer than 220 pounds of hazardous waste per month are classified as Conditionally Exempt Small Quantity Generators. Conditionally exempt generators must identify the wastes they produce and they cannot accumulate wastes on-site in excess of 2,200 pounds. Storing more than 2,200 pounds of hazardous waste on-site will subject the facility to full SQG requirements. Generation of 220 pounds of hazardous waste in any calendar month will subject the facility to SQG requirements.

The facility shows good promise for waste management. The facility has already eliminated some of its solvent usage through the purchase of a Hotsy. This pressure washer has also improved cleaning efficiency. Employees are knowledgeable about hazardous waste issues. Lids and containers were in place during the audit and the shop was clean and orderly.

Management is concerned about proper handling of hazardous wastes and materials and is just now completing a contingency plan and emergency response procedures manual for the management of hazardous wastes. The shop also maintains material safety data sheets on most materials used in the shop. During the audit process shop mechanics were helpful in obtaining data sheets that were not available. These sheets are useful in determining potential hazardous waste streams and possible occupational health exposures.

To minimize the generation of hazardous waste, the aviation facility should:

- a. Adopt workplace practices that will diminish the quantity of hazardous material consumed and, therefore, reduce the quantity of hazardous waste generated. Use only the amount of paint and thinner needed during paint operations and equipment cleaning. Utilize paint guns that produce the least amount of overspray.
- b. Consider, when making capital investments, technologies that are designed to reduce hazardous wastes. The PMB paint stripper and a solvent distillation unit are worthy of further investigation as to their applicability to this facility
- c. Develop tighter inventory controls to better monitor the quantity of materials used and the amount of waste produced. Control the amount of solvent used to clean paint guns. Further evaluate the pressurized solvent spray booth for excessive raw material loss and consider enclosing the system to prevent loss.
- d. Provide training programs to workers to insure efficient use of

materials and to make them more aware of potential job safety and health hazards.

e. Maintain good housekeeping procedures by properly storing wastes and materials and keeping lids in place when materials are not being used.

f. Reduce dragout by allowing parts to drain prior to removal from specific tanks and baths.

g. Conduct periodic hazardous waste audits to maintain an up-to-date and consistent facility hazardous waste profile.

Appendix A

Synopsis of the Small Quantity Generators Regulations

Facilities producing between 220 and 2200 pounds of hazardous wastes per month are subject to the Small Quantity Generator regulations. These regulations will require waste producing facility to:

- 1) Identify the hazardous wastes produced.
- 2) Obtain an EPA identification number.
- 3) Ship hazardous wastes for treatment, storage, or disposal in EPA approved facilities. The shipment will have to meet the requirements set by the Federal Department of Transportation for hazardous wastes. In addition the shipment will have to be accompanied by a manifest containing the generator's name and address, the shippers name, and the name and address of the receiving facility.
- 4) The hazardous wastes should be offered, at least every 180 days, to shippers and disposal facilities with an EPA identification number. In Alaska, because there are no EPA certified hazardous waste disposal sites within 200 miles, the wastes can be stored for 270 days. The maximum weight of the wastes being stored, however, cannot exceed 13,200 pounds.
- 5) Finally, the waste generator should keep a copy of the shipping manifest for three years.



U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 SIXTH AVENUE
SEATTLE, WASHINGTON 98101

OCT 03 1986

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REPLY TO
ATTN OF M/S 530

WASTE MANAGEMENT BRANCH

David Wigglesworth
Alaska Health Project
417 W Eighth Avenue
Anchorage, Alaska 99501

David
Dear Mr. Wigglesworth:

This is in reply to your question regarding information required by the Alaska Health Project's small quantity generator study. The purpose of this project is to study general waste management procedures and processes for specific small quantity generator categories. We hope to identify common current waste practices that can be better managed, and/or methods where waste generation can be minimized.

Because we wish the study results and recommendations to be as widely applicable to other generators as possible, we would like to obtain information which characterizes the representative generators you are studying. We do not feel any facility-specific identifiers will be necessary, but we would like any information on the facility type, process, size of operation, and/or any other information which would have bearing on the usefulness or extrapolation of the data to other generators, both in and outside of Alaska.

If you have further questions, please feel free to contact me.

Sincerely,

Joan Cabreza
Joan Cabreza
RCRA Program Development

Vehicle Maintenance

IF YOU REPAIR OR MAINTAIN

- cars
- vans
- trucks
- heavy equipment
- farm equipment
- planes
- boats

- or if you
- remove oil or grease
- remove rust, dirt or paint
- repair or rebuild
- refinish or restore
- paint
- replace lead-acid batteries

the products you use on the vehicles, and on your equipment, tools, hands, or floor may contain hazardous materials, and the wastes generated by using these products may be hazardous wastes.

PRODUCTS CONTAINING HAZARDOUS MATERIALS

Everyday mechanics, bodymen and others use products containing hazardous materials. Products like:

- Rust removers, which contain strong acid or alkaline solutions

- Carburetor cleaners, which contain flammable or combustible liquids

- Used rags containing combustible or flammable solvents
- Paints with flammable or combustible thinners or reducers
- Auto and truck batteries

contain chemicals or materials which are hazardous to human health and the environment. Table 1 lists typical operations/processes which use products that may contain hazardous materials and which probably generate hazardous wastes. If you generate 220 pounds (about half of a 55-gallon drum) or more of hazardous waste per month, you must fill out a Uniform Hazardous Waste Manifest when you ship this waste off your property.

UNIFORM HAZARDOUS WASTE MANIFEST

Item 11 of the Uniform Hazardous Waste Manifest requires the proper Department of Transportation (DOT) shipping description, which includes:

- the proper DOT shipping name for each waste. To help you complete this item, Table 2 provides this information for some of the hazardous wastes you are most likely to generate. To obtain the DOT shipping name, hazard class and UN/NA identification number: Select the typical process/operation from column 1 of Table 1. Match the ingredients from column 3 and the waste type generated from column 4 of Table 1 with the waste type and ingredient in column 1 of Table 2.

Not all vehicle maintenance operations generate hazardous wastes. If you don't see a particular chemical that you use, or if you generate a waste not listed, or if you need any type of help, call your state hazardous waste management agency.

NOTE: Under current federal law, you do not have to use a Manifest when you ship:

- used/dead lead acid batteries that are destined for recycling
- used motor oil. Be aware, however, that the regulations for used oil may change. You should still use environmentally sound methods for the collection, storage and recycling of used motor oil.

Remember—your state may have its own requirements for lead acid batteries or used oil. Be sure to check with your state hazardous waste management agency.

TYPICAL PROCESS/OPERATION	TYPICAL MATERIALS USED	TYPICAL MATERIAL INGREDIENTS ON LABEL	GENERAL TYPES OF WASTES GENERATED
Oil and grease removal	degreasers—(1) gasol, carburetor cleaners, engine cleaners, solvents, acids/alkalis	petroleum distillates, aromatic hydrocarbons, mineral spirits	ignitable wastes, spent solvents, combustible solids, waste acids/alkaline solutions
Engines, parts and equipment cleaning	degreasers—(1) gasol, carburetor cleaners, engine cleaners, solvents, acids/alkalis, cleaning fluids	petroleum distillates, aromatic hydrocarbons, mineral spirits, benzene, toluene, petroleum naphtha	ignitable wastes, spent solvents, combustible solids, waste acids/alkaline solutions
Rust removal	acid jelly, strong acids, strong alkalies	phosphoric acid, hydrochloric acid, hydrofluoric acid, sodium hydroxide	waste acids, waste alkalies
Paint preparation	paint thinners, enamel reducers, white spirits	alcohols, petroleum distillates, oxygenated solvents, mineral spirits, ketones	spent solvents, ignitable wastes, ignitable paint wastes, paint wastes with heavy metals
Painting	enamels, lacquers, epoxies, alkyds, acrylics, primers	aromatics, toluene, petroleum distillates, epoxy ester resins, methylated chloroform, styrene, VM&P naphtha, aromatic hydrocarbons, methyl methacrylate, ketones	ignitable paint wastes, spent solvents, paint wastes with heavy metals, ignitable wastes
Spray booth, spray gun, and brush cleaning	paint thinners, enamel reducers, solvents, white spirits	ketones, alcohols, toluene, acetone, isopropyl alcohol, petroleum distillates, mineral spirits	ignitable paint wastes, heavy metal paint wastes, spent solvents
Paint removal	solvents, paint thinners, enamel reducers, white spirits	aromatics, toluene, petroleum distillates, methanol, methylated chloroform, isopropyl alcohol, mineral spirits, alcohols, ketones, other oxygenated solvents	ignitable paint wastes, heavy metal paint wastes, spent solvents
Used lead acid batteries	car, truck, boat, motorcycle, and other vehicle batteries	lead, zinc, less than 1% free acids	used lead acid batteries, strong acid-alkaline solutions

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Table 2
WASTE DESCRIPTIONS*

WASTE TYPE	DESIGNATIONS/ TRADE NAMES	DOT SHIPPING NAME	HAZARD CLASS	UN/NA ID NUMBER
STRONG ACID-ALKALINE WASTES				
Arsenic Hydroxide	Arsenic Hydroxide, NADA, Type of Hydroxide, Agas Arsenic	Waste Arsenic Hydroxide containing not less than 12% but not more than 44% arsenic	Corrosive Material	NA367
		containing less than 12% arsenic	OR34-A	NA367
Hydrofluoric Acid	Hydrofluoric Acid, HF	Waste Hydrofluoric Acid (not more than 49% strength)	Corrosive Material	UN178
Hydrochloric Acid	Hydrochloric Acid, HCL, Muriatic Acid	Waste Hydrochloric Acid	Corrosive Material	NA178
Hydrofluoric Acid	Hydrofluoric Acid, HF, Fluorhydric Acid	Waste Hydrofluoric Acid	Corrosive Material	UN178
Nitric Acid	Nitric Acid, HNO ₃ , Aqua Fortis	Waste Nitric Acid (over 40%) (40% or less)	Oxidizer Corrosive Material	UN203 NA178
Phosphoric Acid	Phosphoric Acid, H ₃ PO ₄ , Orthophosphoric acid	Waste Phosphoric Acid	Corrosive Material	UN188
Potassium Hydroxide	Potassium Hydroxide, KOH, Potassium Hydroxide, Caustic Potash, Potassa	Waste Potassium Hydroxide Solutions Dry Solid, Flake, Bead, or Granular	Corrosive Material Corrosive Material	UN184 UN183
Sodium Hydroxide	Sodium Hydroxide, NaOH, Caustic Soda, Soda Lye, Sodium Hydroxide	Waste Sodium Hydroxide Solutions Dry Solid, Flake, Bead, or Granular	Corrosive Material Corrosive Material	UN183 UN183
Sulfuric Acid	Sulfuric Acid, H ₂ SO ₄ , Oil of Vitriol	Waste Sulfuric Acid	Corrosive Material	UN183
Chromic Acid	Chromic Acid	Waste Chromic Acid Solution	Corrosive Material	UN173
IGNITABLE WASTES				
Ignitable Waste NOS	Carbonar Cleaners,	Waste Flammable Liquid	Flammable Liquid	UN199
Aromatic Hydrocarbons	Ignitable Waste NOS	NOS	Combustible Liquid	NA199
Petroleum Distillates		Waste Combustible Liquid NOS Waste Flammable Solid NOS	Combustible Liquid NOS Flammable Solid	UN120 UN132
IGNITABLE PAINT WASTES				
Ethylene Dichloride	Ethylene Dichloride, 1,2-Dichloroethane	Waste Ethylene Dichloride	Flammable Liquid	UN184
Benzene	Benzene	Waste Benzene (benzol)	Flammable Liquid	UN114
Toluene	Toluene	Waste Toluene (toluol)	Flammable Liquid	UN124
Ethyl benzene	Ethyl benzene	Waste Ethyl benzene	Flammable Liquid	UN125
Chlorobenzene	Chlorobenzene, Monochlorobenzene, Phenylchloride	Waste Chlorobenzene	Flammable Liquid	UN134
Methyl Ethyl Ketone	Methyl Ethyl Ketone, MEK, Methyl Acetone, Mervet, Butanone, Ethyl Methyl Ketone	Waste Methyl Ethyl Ketone	Flammable Liquid	UN119
SPENT SOLVENTS				
White Spirits, Varnal	White Spirits, Mineral Spirits, Naphtha	Waste Naphtha	Flammable Liquid Combustible Liquid	UN233 UN233
1,1,2-Trichloroethane	Aurethane TC, Chloron, Chloroform, Methyl- Chloroform, Alpha TC, Chloroform	Waste 1,1,2-Trichloroethane	OR34-A	UN201
Petroleum distillates	Petroleum Distillates	Petroleum Distillate	Flammable Liquid Combustible Liquid	UN126 UN126
PAINT WASTES WITH HEAVY METALS				
Paints with heavy metals	Heavy Metals Paint	Hazardous Waste, Liquid or Solid, NOS	OR34-E	NA989
Lead				
Nickel				
Chromium				

*These descriptions may change plus variations in waste characteristics or conditions.

*NOS - Not otherwise specified.

*A flammable liquid has a flash point below 100°F.

*A combustible liquid has a flash point between 100°F and 200°F.

EPA

Notice of Potential Risk

APPENDIX D

Burning Used Oil In Space Heaters

Summary

Persons who own and operate space heaters that burn used oil should be sure that exhaust gases from such burning are vented to outside air, in order to minimize exposure to lead and other toxic substances.

In addition to the warning transmitted through this Advisory, EPA has proposed a regulation that prohibits the burning of used oil in unvented space heaters (Federal Register, Vol. 50, p. 1684, January 11, 1985).

Basis for Concern

In some workplaces, especially garages, service stations, etc., used oil is burned in space heaters to heat the workplace. Used oil, especially oil from gasoline-powered engines, contains lead that has been deposited as a by-product of fuel combustion in the engine. When this oil is burned, lead is present in the exhaust gases. If these gases are not vented to the outside, workplace air can become seriously contaminated with lead.

Excessive levels of lead in inhaled air can cause toxic effects in humans, including nerve and irreversible brain damage, kidney failure, anemia, high blood pressure, various blood and metabolic disorders, and gastrointestinal disturbances.

Lead particles may also be deposited on workplace surfaces if exhaust gases are not vented. These particles can be ingested inadvertently, increasing the exposure to lead.

In addition to lead, waste oil usually contains other toxic materials or chemicals that are not completely destroyed or removed during combustion. For instance, high levels of arsenic, cadmium, chromium, barium, polynuclear aromatic hydrocarbons and various solvents were found in some waste oil samples that were analyzed by

...A. The emissions of some of these chemicals (e.g., arsenic and chromium) from a single space heater are associated with significant cancer risk. EPA's phasedown of lead in gasoline will result in lower lead levels in used oil, but will not result in any appreciable decline in the levels of other contaminants. Those contaminants, some of which are carcinogens, will continue to pose risks if space heaters are not properly vented. Oxides of nitrogen and sulfur, which can cause respiratory impairments in humans, are also present in exhaust gases from waste oil burning. Exposure to these other materials in addition to lead, via the exhaust gases of space heaters, should be minimized.

Background

There are two types of space heaters that are designed to burn waste oil: vaporizing and atomizing burners. Vaporizing burners operate by heating a film of oil below the combustion zone to cause vaporization of the oil, which is then burned. Atomizing burners use low-pressure air to create an atomized mist of oil in the combustion zone, and the mist is burned.

EPA conducted test burns in both types of space heaters with used oil that contained lead in the amounts seen in waste oil. Levels of lead in the flue gases were measured, and these levels were used to calculate the probable levels of lead in workplace air under typical ventilation conditions.

Based on these measurements and calculations, EPA estimates that unvented space heaters that burn used oil may produce levels of lead in workplace air that could be 6 to 1400 times greater than the lead levels known to cause toxic effects in adults.

Recommendation

Space heaters that burn used oil should be installed such that the exhaust gases are vented to the outside, in order to prevent build up of toxic levels of lead in the air of the heated space. Care should be taken so that the vented exhaust gases do not cause unnecessary exposures to people outside the heated workplace; the vent should exhaust the gases above roof level where feasible, avoiding passers-by or air intakes for other buildings. The owner should contact the space heater supplier for help in proper installation, venting and maintenance of the unit.

For a copy of the information supplement to this chemical advisory, call toll-free: 800-424-9065; Washington, DC: (554-1404); Outside the USA: (Operator-202-554-1404); Edward A. Klein, Director, TSCA Assistance Office, Office of Toxic Substances, U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460.

were approved by OMB under control number 2050-0047. The recordkeeping requirements contained in paragraph (f) of this section were approved by OMB under control number 2050-0047.)

§ 268.15 Standards applicable to burners of hazardous waste fuel.

Owners and operators of industrial furnaces and boilers identified in § 268.11(b) that burn hazardous waste fuel are "burners" and are subject to the following requirements:

(a) **Prohibitions.** The prohibitions under § 268.11(b):

(b) **Notification.** Notification requirements under section 3010 of RCRA for hazardous waste fuel activities. Even if a burner has previously notified EPA of his hazardous waste management activities and obtained a U.S. EPA Identification Number, he must renotify to identify his hazardous waste fuel activities.

(c) **Storage.** (1) For short term accumulation by generators who burn their hazardous waste fuel on site, the applicable provisions of § 262.34 of this chapter.

(2) For existing storage facilities, the applicable provisions of Subparts A through I of Part 263, and Parts 270 and 124 of this chapter; and

(3) For new storage facilities, the applicable provisions of Subparts A through I of Part 264, and Parts 270 and 124 of this chapter.

(d) **Required notices.** Before a burner accepts the first shipment of hazardous waste fuel from a marketer, he must provide the marketer a one-time written and signed notice certifying that:

(1) He has notified EPA under section 3010 of RCRA and identified his waste-as-fuel activities; and

(2) He will burn the fuel only in a boiler or furnace identified in § 268.11(b).

(e) **Recordkeeping.** In addition to the applicable recordkeeping requirements of Parts 264 and 265 of this chapter, a burner must keep a copy of each certification notice that he sends to a marketer for three years from the date he last receives hazardous waste fuel from that marketer.

(The notification requirements contained in paragraph (b) of this section were approved by OMB under control number 2050-0047. The storage requirements contained in paragraph (c) of this section were approved by OMB under control number 2050-0047. The certification requirements contained in paragraph (d) of this section were approved by OMB under control number 2050-0047. The recordkeeping requirements contained in paragraph (e) of this section were approved by OMB under control number 2050-0047.)

12. Subpart E is added as follows:

Subpart E—Used Oil Burned for Energy Recovery

Sec.

268.40 Applicability.

268.41 Prohibitions.

268.42 Standards applicable to generators of used oil burned for energy recovery.

268.43 Standards applicable to marketers of used oil burned for energy recovery.

268.44 Standards applicable to burners of used oil burned for energy recovery.

Subpart E—Used Oil Burned for Energy Recovery

§ 268.40 Applicability.

(a) The regulations of this subpart apply to used oil that is burned for energy recovery in any boiler or industrial furnace that is not regulated under Subpart O of Part 264 or Part 265 of this chapter, except as provided by paragraphs (c) and (e) of this section. Such used oil is termed "used oil fuel". Used oil fuel includes any fuel produced from used oil by processing, blending, or other treatment.

(b) "Used oil" means any oil that has been refined from crude oil, used, and, as a result of such use, is contaminated by physical or chemical impurities.

(c) Except as provided by paragraph (d) of this section, used oil that is mixed with hazardous waste and burned for energy recovery is subject to regulation as hazardous waste fuel under Subpart D of Part 268. Used oil containing more than 1000 ppm of total halogens is presumed to be a hazardous waste because it has been mixed with halogenated hazardous waste listed in Subpart D of Part 261 of this chapter. Persons may rebut this presumption by demonstrating that the used oil does not contain hazardous waste (for example, by showing that the used oil does not contain significant concentrations of halogenated hazardous constituents listed in Appendix VIII of Part 261 of this chapter).

(d) Used oil burned for energy recovery is subject to regulation under this subpart rather than as hazardous waste fuel under Subpart D of this part if it is a hazardous waste solely because it:

(1) Exhibits a characteristic of hazardous waste identified in Subpart C of Part 261 of this chapter, provided that it is not mixed with a hazardous waste; or

(2) Contains hazardous waste generated only by a person subject to the special requirements for small quantity generators under § 261.5 of this chapter.

(e) Except as provided by paragraph (c) of this section, used oil burned for energy recovery, and any fuel produced from used oil by processing, blending, or

other treatment, is subject to regulation under this subpart unless it is shown not to exceed any of the allowable levels of the constituents and properties in the specification shown in the following table. Used oil fuel that meets the specification is subject only to the analysis and recordkeeping requirements under §§ 268.42(b) (1) and (6). Used oil fuel that exceeds any specification level is termed "off-specification used oil fuel".

USED OIL EXCEEDING ANY SPECIFICATION LEVEL IS SUBJECT TO THIS SUBPART WHEN BURNED FOR ENERGY RECOVERY*

Constituent/property	Allowable level
Arsenic	5 ppm maximum
Cadmium	2 ppm maximum
Chromium	10 ppm maximum
Lead	100 ppm maximum
Flash Point	100 °F minimum
Total Halogens	4,000 ppm maximum ^b

* The specification does not apply to used oil mixed with a hazardous waste other than small quantity generators' hazardous waste.

^b Used oil containing more than 1,000 ppm total halogens is presumed to be a hazardous waste under the regulations promulgated under § 268.40(c). Such used oil is subject to Subpart D of this part rather than the subpart when burned for energy recovery unless the presumption of being hazardous waste is rebutted.

§ 268.41 Prohibitions.

(a) A person may market off-specification used oil for energy recovery only:

(1) To burners or other marketers who have notified EPA of their used oil management activities stating the location and general description of such activities, and who have an EPA identification number; and

(2) To burners who burn the used oil in an industrial furnace or boiler identified in paragraph (b) of this section.

(b) Off-specification used oil may be burned for energy recovery in only the following devices:

(1) Industrial furnaces identified in § 260.10 of this chapter; or

(2) Boilers, as defined in § 260.10 of this chapter, that are identified as follows:

(i) Industrial boilers located on the site of a facility engaged in a manufacturing process where substances are transformed into new products, including the component parts of products, by mechanical or chemical processes;

(ii) Utility boilers used to produce electric power, steam, or heated or cooled air or other gases or fluids for sale; or

(iii) Used oil-fired space heaters provided that:

(A) The heater burns only used oil that the owner or operator generates or used oil received from do-it-yourself oil



TABLE 1—SOLVENT CONCENTRATIONS IN USED OIL AT GENERATOR FACILITIES

Type of generator	Solvent Concentrations, ppm (100% petroleum-based)		
	Solvent A*	Solvent B*	Solvent C*
Automotive oil	10	10	20
Industrial oil	30	30	30

* Solvent A: 1,1,1-Trichloroethane
 * Solvent B: Toluene
 * Solvent C: Xylene
 Source: Franklin Associates, Ltd., *Composition of Used Oil*, p. 3-23 to 3-24.

Consequently, it does not appear that classifying small quantity generator waste-used oil mixtures as hazardous waste would result in classifying large percentages of used oil as ordinary hazardous waste. As a factual matter, EPA's stated concern at proposal thus does not appear to be present.

The final rule thus states that this type of mixture is to be classified as a hazardous waste. (But as explained below, at least for purposes of this rulemaking, these mixtures are subject to regulation as used oil fuel when burned for energy recovery.) We have decided, however, at least for the time being to regulate this (usually exempt) small quantity generator waste regardless of the quantity generated when it is mixed with used oil as part of a waste-derived fuel. EPA is taking this step for a number of reasons. To do otherwise would create the very situation feared by the commenters whereby the rules would create an incentive to adulterate and be much more difficult to enforce. This is because if small quantity generator waste could be mixed with otherwise-regulated used oil and the mixture was exempt from regulation, people undoubtedly would take advantage of the opportunity to escape regulation, or raise the issue of mixing as a defense in enforcement actions. Potentially large volumes and percentages of recycled used oil could go unregulated, in derogation of Congressional intent.⁴⁰ Thus, the final

rule contains an amendment to § 261.3 indicating that small quantity generator hazardous waste-used oil mixtures are not exempt from regulation when burned for energy recovery but are subject to Subpart E of Part 266.

This means that, at least on an interim basis, such mixtures can be burned in nonindustrial boilers if they meet the fuel specification. These mixtures also are subject to the administrative controls for off-specification used oil fuels should they fail to meet the fuel specification. Generators of these mixtures would not be subject to regulation unless they are also marketers of used oil fuel. (See Part Four below.)

EPA has not reached a final decision on which controls should apply to this type of hazardous waste. We also wish to examine further and seek comment on the impacts on small businesses should all of these hazardous wastes be regulated at various levels of control. See RCRA section 3001(d). Because we believe further comment on an ultimate regulatory regime is appropriate, we have decided to retain as an interim measure the regulatory scheme initially proposed whereby this type of small quantity generator waste remains subject to all of the controls applicable to used oil fuel. This will ensure that there is no outright exemption while the Agency evaluates an ultimate resolution in its consideration of comment on the comprehensive rules for recycled oil soon to be proposed.

3. *Used Oil that Exhibits a Characteristic of Hazardous Waste.* Used oil itself might be a hazardous waste if it exhibits a characteristic of hazardous waste. The most likely

result consistent with Congressional intent that recycled oil be regulated is necessary to protect human health and the environment, particularly in light of statements of evident legislative intent that crankcase oil (which is generated by small quantity generators) be regulated. See RCRA section 3014(b); H.R. Rep. 98-441, at 6.

• The total volume of recycled used oil generated by small quantity generators is significantly greater than that of all other small quantity generator hazardous waste combined: 340,000 tons/year vs. 100,000 tons/year.

• Unregulated small quantity generator used oil could have greater potential for coming into direct human contact than other small quantity generator wastes because such a large volume is burned in the residential sector.

Thus, the Agency sees important distinctions between small quantity generator used oil and other small quantity generator hazardous waste. This reasoning also applies to regulating recycled oil in today's final rule—prior to recycled oil being a hazardous waste—without regard for quantity generated. (The Agency is not reaching the question of whether, assuming there was no difference between small quantity generator used oil and other small quantity generator hazardous waste, either hazardous waste generated in volumes of 0-100 kg per month should be regulated.)

possibility is ignitability.^{41, 42} As discussed at proposal (see 50 FR at 1660), EPA intends that used oil that is a hazardous waste solely because it exhibits a characteristic of hazardous waste be regulated as used oil fuel (where so recycled), provided that it is not mixed with a hazardous waste.⁴³ Ignitable used oil is regulated as used oil under today's rule and is prohibited from burning in nonindustrial boilers when its flash point is less than that of commercial fuel (i.e., 150°F).

We have considered whether a low flash point serves as a presumptive indication of mixing with hazardous waste, and therefore that such mixtures should be regulated as hazardous wastes ineligible for regulation under section 3014 standards for used oil. We conclude that low flash point is not an indicator of mixing for a number of reasons and that such oil should be regulated as used oil.

Low flash point may not be indicative of mixing with hazardous waste because the low flash point may be attributable to benzene, toluene, or xylene added to crankcase oil from engine blow-by (these compounds are constituents of gasoline) rather than as spent solvent. Low flash point could also be attributable to mixing gasoline from tank drainings at auto service and repair shops with used oil. Gasoline is a commercial chemical product exhibiting a characteristic of hazardous waste. When gasoline for any commercial chemical product is discarded, it is subject to regulation as hazardous waste. But when a commercial chemical fuel is recycled (e.g., mixed with used oil and burned for energy recovery), it is not discarded (within the meaning of the rule) and so is not a hazardous waste. See § 261.33 (July 15, 1985) and 50 FR 618 (January 4, 1985).

In addition, today's rule for burning low flash point used oil (or any off-

⁴⁰ Although most used oils have a flash point greater than 300°F, 25% of the used oil samples had a flash point less than 140°F. Source: Franklin Associates Ltd., *Composition of Used Oil*, p. 3-44.

⁴¹ Although used oil may contain high levels of lead, arsenic, cadmium, chromium, or barium, it does not often exhibit the characteristic of toxicity for these metals. In addition, these metals are present in used oil almost invariably as a result of the oil's use, not as a result of adulteration with hazardous waste. Nevertheless, since these metals can pose a hazard when used oil is burned for energy recovery, the specification for metals that may be burned in commercial boilers (metal levels of arsenic, cadmium, chromium, and lead, barium levels are not considered to pose a substantial health hazard and, thus, barium is not included in the specification. (See section 17.2C in the text.)

⁴² Except that mixtures of small quantity generator hazardous waste and used oil are subject to regulation as used oil, as discussed above.

sents mistake the Agency's use: to distinguish used oil from hazardous waste. As EPA pointed out in the preamble to the proposed rule, the presumption is not a new test. Section 261.2(b) says that when used oil is mixed with a hazardous waste, the mixture is a hazardous waste unless it does not exhibit a characteristic of hazardous waste, or if the mixture was a listed waste (many halogenated solvents), unless the mixture is delisted under petitioning provisions of 40 CFR 260.20 and 260.22. The rebuttable presumption merely provides a simple, objective test for which the Agency will presume such a determination has occurred. The risks posed by mixing both hazardous waste (including adulterated used oil) and off-specification used oil are addressed in the Agency's rule with respect to burning in industrial boilers and will be addressed further by the permit standards for burning such fuels in industrial boilers and industrial processes.

We note further that a number of commenters erred by considering the rebuttable presumption level for total halogens to fix the level at which used oil containing halogens would be subject to regulation (assuming no other source of adulteration). The rebuttable presumption is not a measure of when adulteration is necessary, but a measure of when mixing can be presumed to have occurred. Used oil containing halogens at less than the presumption level could still be regulated as hazardous waste, but the burden would be on EPA to prove that such used oil is a hazardous waste by virtue of mixing with a listed hazardous waste. See 50 FR 1892, n. 22. EPA's burden would not automatically be satisfied by showing evidence of halogen levels in the used oil.

(2) *Organic Versus Total Halogens as the Indicator Level.* Several commenters suggested that organically-bound chlorine (or, more correctly, halogens) rather than total chlorine should be used for the presumption of mixing because it avoids the problems with inorganic halogens discussed above (i.e., some oils with insignificant hazardous halogenated solvent levels may contain more than 1000 ppm total halogens because of presence of inorganic chlorine). After serious consideration, we have decided to base the presumption on total halogen levels due to the problems of implementing a standard based on organic halogens.

We know of no quick, simple method for determining organically-bound halogen levels in used oil. The sample must be "washed" to remove inorganic

halogens before determining organic halogen levels. Moreover, we have only just recently investigated techniques for washing to remove inorganic halogens from used oil and are not yet ready to recommend a procedure. Even if an acceptable technique were available, washing would add substantially to the time required to determine halogen levels. (See discussion of analytical procedures in section IV-F of Part Two of this preamble.) The need for washing also would raise analytical costs unnecessarily.

In addition, organic halogens would be a more accurate measure of presence of hazardous halogenated solvents than total halogens only if used oil often contains more than 1000 ppm of inorganic halogens. We have discussed above, however, that the data indicate that inorganic halogen levels are generally lower than 1000 ppm. Finally, use of organic halogens rather than total halogens does not avoid the problem of occasional false-positives caused by nonhazardous organic chlorine additives found in metalworking oils.

In summary, a presumption based on organic halogen levels offers few advantages and has serious problems.

2. *Used Oil Containing Hazardous Waste Generated by Small Quantity Generators.* EPA proposed that used oil containing hazardous waste generated by small quantity generators be regulated as used oil. 50 FR 1892. The Agency reasoned that in exercising its discretion as to how to classify used oil (i.e., as used oil or as hazardous waste), EPA should avoid a scheme whereby most used oil was classified as hazardous waste ineligible for regulation under the special standards for used oil. EPA was concerned that this might result if small quantity generator hazardous waste-used oil mixtures were classified as hazardous waste. *Id.* At the same time, EPA solicited comments on alternative approaches, including regulating such mixtures as hazardous waste or classifying only automotive oil containing small quantity generator waste as used oil. *Id.* at n. 24.

Comments were divided. Although some commenters supported the Agency, others were critical, maintaining that EPA's proposal could encourage adulteration of used oil, and lead to significant enforcement problems.

EPA has decided to modify its proposal, in part due to the public comments. More importantly, however, our re-evaluation of available data indicates that few small quantity generators are presently mixing

hazardous waste with used oil. Analyses indicate that fewer than 15% of the generators of crankcase oil (who are presumed to be small quantity generators), and fewer than 12% of the generators of industrial oils (some of whom may have been small quantity generators), generate used oil that is mixed with significant levels of halogenated hazardous solvents.⁴⁴ In addition, the average vehicle maintenance shop or service station, according to EPA's data,⁴⁵ produces an average of 50 kg/month of hazardous waste in the form of spent solvents, and 500 kg/month of used oil. Intentional mixing would yield a contamination rate of 10%, or 100,000 ppm. The data in the following table show that actual contamination at the generator site, with few exceptions, is orders of magnitude lower and so probably results from inadvertent, and perhaps unavoidable, contamination during use of the oil or handling of used oil.⁴⁷

⁴⁴ Analysis of 21 samples of crankcase oil known to be obtained from the generator (e.g., service stations, auto repair shops, truck dealer, construction equipment facility), and thus not adulterated with solvents by collectors or processors, reveals that only 3 contain significant levels of hazardous halogenated solvents. Analysis of 28 samples of industrial oil known to be obtained from the generator indicate only 3 contain significant levels of hazardous halogenated solvents. Analysis of data in Franklin Associates, Ltd., *Composition of Used Oil*, Appendix A.

⁴⁵ Industrial Economics, Inc., *Draft Regulatory Analysis for Proposed Regulations Under RCRA for Small Quantity Generators of Hazardous Waste*, February 1985, Draft Report, Exhibit 3-L.

⁴⁷ Several commenters mistakenly criticized EPA's statement at proposal (50 FR 1892) that small quantity generators do not massively adulterate their used oil. They reasoned that because most used oil comes from small quantity generators, and much is adulterated, that the generators are doing the adulteration. In fact, all data indicate that collectors and processors are the principal source of hazardous waste contamination. Comparison of used oil sampling data from generators and from processing facilities in the table below shows a dramatic increase in halogenated solvent levels at used oil processing facilities.

Solvent Concentrations Increase Dramatically as Used Oil Moves From the Generator to Processing Facilities

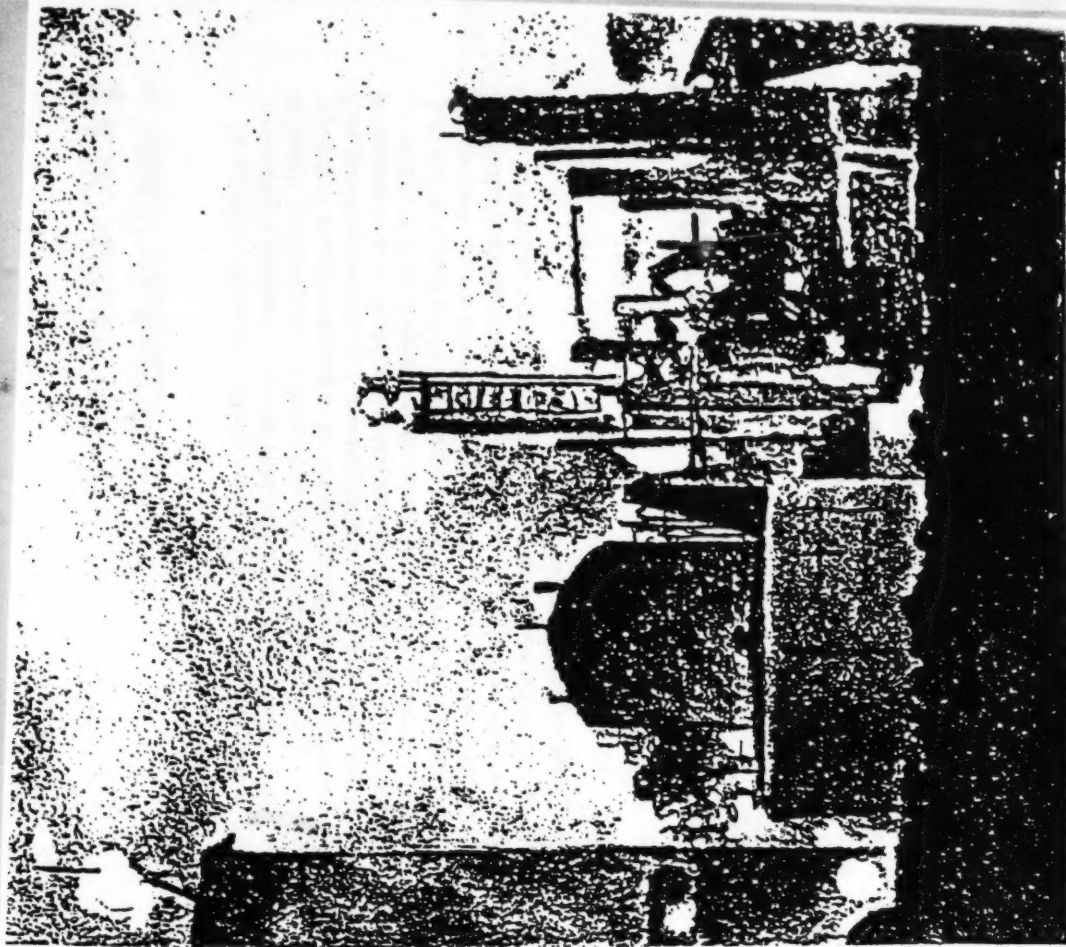
	Solvent Concentrations, ppm (1000 parts per billion)		
	Solvent A ¹	Solvent B ²	Solvent C ³
Oil sampled at generator after:			
Automotive oil	10	11	10
Industrial oil	20	20	20
Oil sampled at processing facility:			
Automotive oil	5,000	500	5,000
Industrial oil	2,500	500	2,500

¹ T.L.I. Truck Washers.

² Trichloroethylene.

³ Trichloroethylene.

Source: Franklin Associates, Ltd., *Composition of Used Oil*, pp. 2-23 to 2-25.



Alternatives for Management of Waste Oil



Department of Environmental Conservation
P.O. Box 0
Juneau, Alaska 99811-1800

PLACE
STAMP
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TO:

21

Overview

This booklet has been prepared by the Alaska Department of Environmental Conservation (DEC) to inform the public about acceptable methods of recycling or disposing of waste oil.

Waste oil generated in Alaska constitutes a valuable resource when it is properly utilized. Recovery of this resource through collection, treatment, and use provides a means of reducing the problems associated with improper waste oil disposal.

Improper disposal can harm the environment and jeopardize public health by polluting watercourses and contaminating drinking water supplies. Waste oil placed in landfills can migrate into the groundwater table, or be carried by surface flows into nearby streams and rivers. Used oil from containers dumped in storm sewers or on the ground can end up in our water supply systems, streams, rivers, and lakes.

A concentration of one part oil to one million parts water can cause taste and odor problems in drinking water. At this ratio, it would only take one quart of oil to noticeably contaminate 250,000 gallons of drinking water. That's more water than 30 people drink in a lifetime.

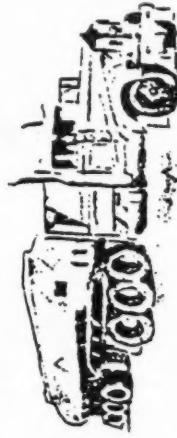
In addition, waste oil may contain heavy metals from additives or engine wear, or may be contaminated by polychlorinated biphenyls (PCBs) and solvents. Some of these contaminants are carcinogenic; some persist in the environment and can enter the food chain. Treatment to remove oil and other contaminants from water supplies is expensive. Prevention is the most cost-effective and health-conscious approach.

The disposal methods outlined here are listed in order of preference; the most preferred method is listed first. A glossary of technical terms has been included in the back of the booklet for your information.

Bill Sheffield, Governor
Bill Ross, Commissioner
August 1986

Is Your Oil A Hazardous Waste?

Before disposing of waste oil, it is necessary to consider whether it may be a hazardous waste. Hazardous wastes are subject to extensive federal requirements that are not addressed in this brochure. Waste oil that has only been used as crankcase oil or transmission or hydraulic fluids, and has not been contaminated with any hazardous waste such as a solvent, will probably not be a hazardous waste. It is important to segregate waste oil from known sources and keep them free of contaminants such as solvents. If you are unsure of the source of your oil or you are aware that it may be contaminated with a hazardous waste, then it will be necessary to contact the Environmental Protection Agency (EPA) for additional guidelines to determine whether it is a hazardous waste before disposal.

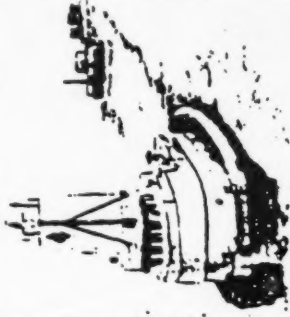


Transportation to Approved Facilities

Removing waste oil from Alaska by barge, rail, or truck to approved collection facilities is the most preferred management method currently available because refining/reprocessing is not a viable industry in Alaska at this time. The cost to generators ranges from about 35 cents to 75 cents per gallon. The following businesses located in Anchorage provide this service:

- Alaska Pollution Control (907) 344-5036
- B&R Trucking (907) 279-6225
- Clean, Inc. (907) 561-4763—this company will take hazardous waste
- CIR/IGA (907) 274-8638
- Torque Turn Specialists, Inc. (907) 344-4161 or in Prudhoe Bay (907) 659-2259

Note: Listing of these companies does not represent an endorsement by this department. Other dealers interested in handling waste oil can be added to future lists by notifying DEC.



Burning Guidelines

Using waste oil as an energy source is allowed by DEC and the EPA under certain circumstances, depending on what levels of contaminants are present and the type of combustion chamber used.

Clean Waste Oil

Clean waste oil contains very low levels of contaminants and may be burned in a wide variety of combustion chambers. These include nonindustrial boilers and furnaces such as those used in small businesses, as well as industrial boilers, utility boilers, and industrial furnaces.

If waste oil is to be considered clean, the flash point must be at least 100 degrees Fahrenheit, and levels of contaminants may not exceed any of the following:

- arsenic—5 parts per million (ppm)
- cadmium—2 ppm
- chromium—10 ppm
- lead—100 ppm
- halogens (fluorine, chlorine, bromine, iodine, astatine)—total must be less than 4,000 ppm

Each individual using waste oil in nonindustrial boilers and furnaces must ensure that the oil meets the above specifications. It may be necessary to obtain an air quality control permit from DEC if your burning device is rated at more than 50,000,000 BTU's per hour. To determine whether these allowable levels are exceeded, waste oil must be tested by a laboratory which can meet DEC/EPA testing requirements. Testing generally costs between \$165 and \$200. Laboratories that will test waste oil include:

- Laucks Laboratories, Inc., Seattle (206) 767-5060
- Rocky Mountain Analytical Lab, Denver (303) 421-6611
- Chemical & Geological Laboratories of Alaska Anchorage 562-2343
- Northern Testing Laboratories, Anchorage 349-8623
- Fairbanks 479-3115

Note: Listing of these companies does not represent an endorsement by this department. Other laboratories interested in testing waste oil can be added to future lists by notifying DEC.

Impure Waste Oil

Waste oil containing higher concentrations of impurities is subject to more restrictions. It may only be burned in certain kinds of burners for certain purposes. These are outlined below. Impure waste oil that is a "listed" hazardous waste under EPA's Resource Conservation and Recovery Act (RCRA) may not be burned under any circumstances.

Type of Burner

Industrial boiler—a boiler located on the site of a manufacturing facility.

Industrial furnace—an enclosed device that is an integral component of a manufacturing process and uses a controlled flame for energy recovery.

Waste oil space heaters—small heaters, used in service stations and auto repair shops, which typically burn 1 or 2 gallons of crankcase oil per hour.

Burning Requirements

In these burners, oil can only be burned for energy recovery.

Use heaters with less than a 500,000 BTU/HR rating that are vented to the outside. Larger units are covered by other requirements.

Marine and diesel engines

Oil can only be burned for energy recovery.

